

SITE: Florida Phosphate  
BREAK: 17.8  
OTHER: v. 51

July 22, 1997

Robert W. Davis

(b) (6)

Dear Mr. Davis:



10518260

This is in response to your concerns resulting from a Fact Sheet entitled "Radiation on Reclaimed Phosphate Lands" by Marvin Resnikoff, Ph.D. and Stanley Waligora, CHP, which was distributed to residents of Floral Park where your home is located.

#### Measurement Results

As a result of your concern, gamma exposure rate measurements were made in and around your home and a short term radon measurement was made inside your home. A gamma measurement was made in the center of each room. These measurements ranged from 24--28 micro-roentgens per hour (uR/hr) with a mean (average) of 26 uR/hr. On your back porch, the level measured was 12 uR/hr. Measurements around the perimeter of your home ranged from 12--20 uR/hr with a mean of 16 uR/hr. For a point of reference, the average background gamma exposure rate for the state of Florida is accepted to be 6 uR/hr. The level of gamma exposure in all areas around your home exceeds the mean for the state.

The reason for these elevated levels is the presence of naturally occurring radioactive materials in the ground beneath your home. Uranium occurs naturally with the phosphate deposits in central Florida. The mining of phosphate and the reclamation process in the area where your home is located left some of these radioactive materials closer to the surface.

The variations in the exposure rates at your home appear to be related to shielding from concrete and fill used in construction of the back porch and in leveling the yard around your home as well as to variations in the quantity of the radioactive materials present and their proximity to the surface.

The measurement of radon in the indoor air was conducted over a six day period under closed house conditions. The result was 0.5 picocuries per liter (pCi/L) of air. The average indoor air radon level in the United States is 1.4 pCi/L. A standard of 4.0 pCi/L

#### POLK COUNTY HEALTH DEPARTMENT

Daniel O. Haight, MD  
Director

RADIOLOGICAL HEALTH SECTION / WATER TESTING LABORATORY  
225 Avenue D, N.W., Winter Haven, FL 33881  
Phone (941) 291-5204 / Fax (941) 291-5208

Lynne M. Sweeney, MD, MPH  
Assistant Director

has been established by the USEPA and the state of Florida. This is the level above which remediation is recommended. The level of radon measured in your home is minimal and well below the mean for the U.S.

### **Dose Estimates**

In determining an estimate of the dose resulting from the gamma exposure rates encountered in and around your home, an estimate of occupancy times is necessary. The "fact sheet" referred to the results of family interviews at Floral Park which stated that on the average, 25 hours per week were spent away from the Park, 25 hours per week were spent in their yard, and the rest of the time was spent in their home. Based on this information, and the measurement results for your home, the estimate of your total gamma dose from this source is about 180 millirem (mrem) per year or approximately 135 mrem per year above background if 6 uR/hr is considered the background exposure rate. As a "worst case" scenario, if you spent all your time in your home, your dose would be about 180 mrem/yr above background or about 230 mrem/yr including background.

### **Dose Comparisons/Variations**

According to the National Council on Radiation Protection and Measurements Report No. 94, the mean estimated total effective dose equivalent rate (average dose rate) for a member of the population in the United States and Canada from the various sources of natural background radiation is about 300 mrem/yr. The following is a breakdown by source:

#### Mean total effective dose equivalent rate (mrem/yr.)

Cosmic/Cosmogenic-----	28
Terrestrial-----	28
Inhaled-----	200
In the body-----	40

In comparing your total dose rate as an individual to this mean for the population as a whole, an understanding of the variability of exposure from these sources should be considered.

### Cosmic

The major variation in cosmic-ray exposure is with altitude. The dose rate doubles for every 2000 meters increase above sea level. Your home's proximity to sea level minimizes your dose from the cosmic source.

### Terrestrial

Your dose from external gamma radiation from the terrestrial source is the primary area of concern presented in the fact sheet. The variability of gamma-ray exposure from the terrestrial source is generally small. However, there are some areas where this exposure is significantly different than the mean. The NCRP Report No. 94 referenced above notes several sites of unusual radiation exposure. The Phosphate Lands of Florida is among those listed. The Bone Valley Formation is the phosphate deposit in central Florida which was mined in the area where your home is located. Uranium was naturally deposited along with the phosphate in this formation. Radium-226 occurs as a result of the radioactive decay of uranium-238 and is primarily responsible for the terrestrial gamma exposure rates in this area.

Another unusual exposure site listed is Denver, Colorado. Here both cosmic and terrestrial exposures are somewhat higher with the total dose equivalent being about 50% higher than the mean for the U.S. The Reading Prong in Pennsylvania, New Jersey, and New York is also listed. It is a geological formation, rich in uranium series radionuclides. In a small area in Clinton, NJ, the mean terrestrial gamma dose is about 150 mrem/yr.

Your dose from the terrestrial source is at the upper end of the distribution for the population as a whole.

### Inhalation

The presence of radon and radon decay products in the indoor environment is the primary source for the inhalation dose. The mean dose to the population from this source is substantially greater than from the other natural background sources. The variability is also the greatest. It is estimated that 0.14% of the population would have an exposure that is 10 times the average and 13% would have an exposure that is 5 times the average. Based on the measurement of radon in your home, your dose from this source is about one-third of the average for the population, near the lower end of the distribution.

### In the body

The dose attributed to radionuclides in the body is dominated by the presence of potassium-40. This radioactive isotope of potassium occurs naturally as a very small portion of the total potassium ingested and therefore of the potassium retained by the body. The total amount in the body is directly related to lean body mass.

The fact sheet made reference to the ingestion of radionuclides by way of several different pathways. One of these was the drinking water pathway. Your water is from a community water supply which must meet specific standards for radionuclides. This water supply has been tested on a regular basis and has consistently met these standards. Incidentally, a recommendation has been made by EPA to raise the standard for radium-226 in drinking water from 5 pCi/L to 20 pCi/L. Recent analysis of epidemiological studies has shown that the risk is not as great as previously thought.

All the other pathways presented in the fact sheet--ingestion or inhalation of dust and soil, ingestion of fish caught in the local lakes, and ingestion of fruit or vegetables grown in the soil--are all possible sources of radionuclides in the body and samples of these materials may demonstrate the presence of very small quantities of radionuclides, however, review of past studies indicates that your dose from these sources is probably minimal. The fact sheet indicated that analysis of samples of soil, citrus, fish, and root crops are planned. We will be glad to review the results of these analyses or consider performing confirmatory sampling if necessary.

### Summary

Overall, your total dose from natural background sources is about the same as the mean for the population. Your position at the upper end of the spectrum for the terrestrial source is offset by your position at the lower end of the spectrum for the inhalation (radon) source.

### **Regulatory Limits/Recommendations**

In the fact sheet references are made to dose rates exceeding regulatory limits. In particular, a regulatory limit of 100 mrem/yr. is stated. This is misleading and needs clarification. There is no regulation limiting the dose that an individual receives from natural background sources. There are regulatory limits with regard to the activities of those licensed to use radioactive materials. No radioactive materials licensee can conduct activities which result in a member of the public receiving a dose greater than 100 mrem/yr. This does not apply to your situation. The mining and reclamation process in

the phosphate lands of central Florida has never been considered a radioactive materials licensed activity.

Even though there are no regulatory limits for exposure from natural background sources, there are recommendations. The National Council on Radiation Protection and Measurements, in their Report No. 91 entitled "Recommendations On Limits For Exposure to Ionizing Radiation", recommend that remedial action be undertaken when the average annual effective dose equivalent from external exposure (excluding medical, but including naturally occurring sources) continuously exceeds 500 mrem. Your annual dose from naturally occurring external sources is well below this level.

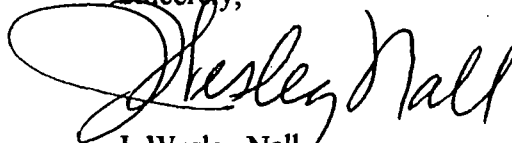
### **Biological Effects**

Finally, a discussion of the biological effects of ionizing radiation is presented in the fact sheet. A reference is made to protracted radiation exposure. This means extending the period of time during which a particular level of exposure is encountered. For example, the dose from a chest x-ray (about 10 mrem) is received in a fraction of a second. The equivalent dose that you receive as a result of where you live is protracted over a period of several weeks. It is a known fact that a protracted dose has less biological effect, primarily due to cell repair mechanisms.

It is a well-known fact that ionizing radiation can cause cancer. It is also known that it can produce genetic effects although at the present time these have not been observed in the offspring of humans. It is presently accepted that the degree of risk for the occurrence of cancer or genetic effects is related to the dose received. It is therefore prudent to reduce doses to "as low as reasonably achievable" (ALARA). However, a zero dose is not possible, and studies cannot show health effects such as cancer within the variations of population dose from natural background sources.

If you have any questions, or if you would like further clarification or explanation, please call.

Sincerely,

A handwritten signature in black ink, appearing to read "J. Wesley Nall". The signature is fluid and cursive, with a large loop at the beginning and a long, sweeping tail.

J. Wesley Nall  
Health Physicist

Robert W. Davis -

(b) (6)

(b) (6)

- 1) Aware of lawsuits - (class action)  
Sachs, & Sachs -  
Facts sheet. (Radon)

Thursday 10:00

~~Don~~

µR/hr

Inside - FR - 28

BR - 25

Bath - 25

MBR - 25

MPBath - 24

DR - 28

Kith - 26

Backporch - 12

Radon Test

Start 0.5 pCi/l.

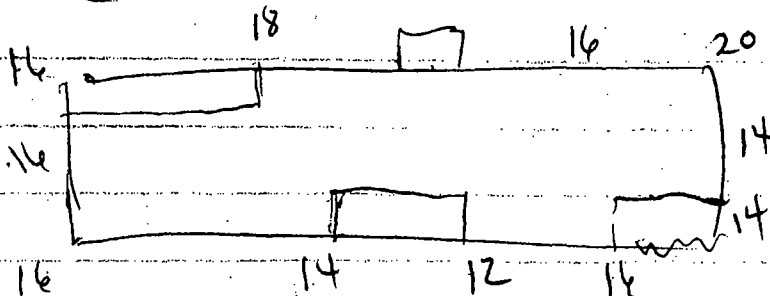
Thurs - 5/22 10:20

Pick Tues (3:00)

Wed

Fruit & fish?

Outside



18  
+28  
160  
172  
111  
162

(b) (6)

$$\begin{array}{r} 3.9 \\ 52 \\ \hline 70 \\ 175 \\ \hline 182.0 \end{array} \quad \begin{array}{r} 2.6 \\ 52 \\ \hline 52 \\ 130 \\ \hline 135.2 \end{array}$$

$$\begin{array}{r} 29 \\ 1004 \\ \hline 50 \\ 205 \\ \hline 226 \\ 246 \\ \hline 275 \end{array} \quad \begin{array}{r} 113 \\ .22 \\ \hline 226 \end{array}$$

$$\begin{array}{r} 168 \\ 204 \\ \hline 1008 \end{array}$$

$$\begin{array}{r} 2.9 \\ 32 \\ \hline 30 \\ 125 \\ \hline 1320 \end{array}$$

$$\begin{array}{r} 168 \\ .02 \\ \hline 336 \end{array}$$

$$\begin{array}{r} 3.4 \\ 52 \\ \hline 68 \\ 170 \\ \hline 176.8 \end{array}$$

$$\begin{array}{r} 76 \\ 26 \\ \hline 176 \\ 152 \\ \hline 1796 \end{array}$$

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Inside - 30 - DR

30 - LR

30 - MBR

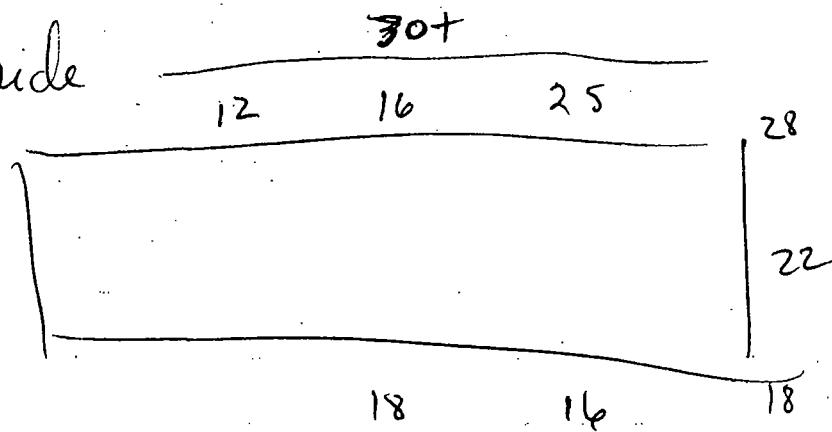
30 - MBath

30 - Kitchen

30 - Bath

Backporch - 10

Outside





## FACT SHEET

### RADIATION ON RECLAIMED PHOSPHATE LANDS\*

Over 80 % of phosphate mining in the United States takes place in central Florida. Florida's phosphate deposits contain radioactive uranium and its radioactive daughter isotopes at concentrations 40 to 70 times greater than that in normal soils. After mining, the land is "reclaimed", but concentrations of radioactive material remain elevated. As a result, higher radiation levels have been found within Floral Park and other communities built upon reclaimed lands. Radiation dose rates exceed regulatory limits and provide unnecessarily high exposures to residents. Doses to infants and children are of particular concern. Appropriate steps must be taken to control and remove the radioactive material.

Radiation dose can be imparted in several ways. Penetrating and long range gamma rays cause whole body radiation exposure due to "shine" from contaminated soil surfaces. Measurements on certain lots show gamma ray exposure rates approximately 200 to 1000 times the natural background levels for the State. Measurements within two hours showed up to ten times background. This is equivalent to having a diagnostic chest x-ray every week or two.

Radiation dose also occurs when the radioactive contaminants are ingested or inhaled. Ingestion can include direct intake of small quantities of soil, soil deposited on crops, and via radioactive isotopes taken up by vegetation through roots in contaminated soil. Children tend to incidentally ingest more soil than adults. Radioisotopes in contaminated lake bottom sediments can work their way up the aquatic food chain and be ingested with fish caught in those lakes. If contaminants work their way into groundwater, then one is concerned with the dose through the drinking water pathway. Contaminated soil can become airborne and be inhaled during windy and dusty conditions and, for example, while tending a garden or landscaping a yard.

Another threat is the unique formation of radioactive radon gas from radium which is equally present with uranium in soil. Radon may diffuse into homes and be inhaled. This possibility has been lessened in homes that are elevated from the ground surface, with the sub-space open on three sides. This allows radon to diffuse out of that space rather than entering the home.

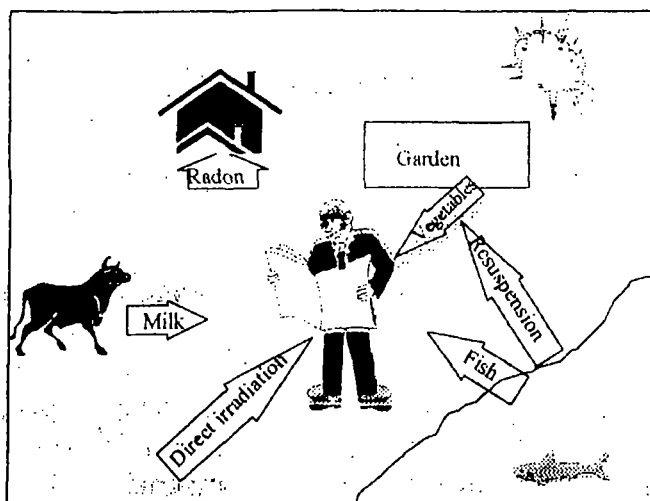
A principle concern with protracted radiation exposure is the possible alteration of chromosomes within tissue cells. This can lead to the formation of cancer and genetic defects. The irradiated cell may die or continue to reproduce with an altered state. If the damage occurs in germ cells, the sperm or ovum, it can cause defective offspring, who in turn will pass these defects on to future generations. Whether radiation causes cancer, disease or genetic damage is a matter of probability. A radioactive emission may or may not hit DNA molecules. The affected molecules may or may not be the key to cell multiplication. Uncontrolled cell multiplication is called cancer.

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\* This fact sheet was produced by physicist Marvin Resnikoff, Ph.D. (Radioactive Waste Management Associates) and health physicist Stanley Waligora, CHP (Environmental Dimensions).

Because radiation has the highest impact on growing cells, young children, fetuses and embryos are the most affected by radiation.

One of the things we do to assess potential radiation doses is to establish an exposure scenario, the conditions accounting for exposure. For example, we recognize that everyone has duties and interests that lead to a certain fraction of time away from home, in the yard, and within the home. While away from the home, there is no elevated exposure to radiation. While in the yard, the exposure rate is at a maximum and within the home, the exposure rate is less than that in the yard because gamma rays are partially shielded by the floor. ~~The families that were~~



**Figure 1. Radiation pathways to a resident living on "reclaimed" land. Direct radiation from the ground, ingestion of food and soil, and inhalation of radon and resuspended particulates are the major pathways.**

~~The families that were~~ interviewed at Floral Park average 25 hours per week away from the Park, 25 hours per week in their yard, and the rest of the time within their home. With this scenario, two homes showing higher gamma ray exposure rates show a direct gamma dose of approximately 500 mRem/yr above background. This is three times the regulatory limit of 100 mRem/yr and is roughly equivalent to the dose due to a diagnostic chest x-ray every week.

As noted earlier, there are many other possible exposure scenarios which lead to inhalation and ingestion of radioisotopes. At this point we do not have enough information to assess the nature and extent of additional radiation dose from these pathways. We have, however, arranged for accurate, passive environmental radiation dosimeter measurements. The first set has been sent to the laboratory, but it is too soon to know those results. We have similarly taken samples of indoor air to determine the level of airborne radon. We have also collected a soil sample and citrus samples which are in the analytical process. We have arranged for fish caught in the lake to be frozen so that we can send that to the laboratory for analysis. Further assessments are planned. For example, we are particularly interested in concentrations of radium-226, lead-210 and polonium-210 in root foods (e.g. carrots and potatoes). As this information develops we will share the results and the significance of the levels that we have found.

The radiation levels that we have found at Floral Lakes must be lowered. Not only do they exceed regulatory limits, but they exceed the average annual dose experienced by radiation workers at hospitals, nuclear power plants, and government facilities. This same kind of remedial action work has been effected for communities, including Grand Junction, CO, West Chicago, IL, and Montclair-West Orange, NJ., where excess levels of contamination and elevated radiation have been found.

## **FACT SHEET**

### **RADIATION ON RECLAIMED PHOSPHATE LANDS\***

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Radiation dose can be imparted in several ways. Penetrating and long range gamma rays cause whole body radiation exposure due to "shine" from contaminated soil surfaces. Our measurements on certain lots show gamma ray exposure rates approximately four to ten times the natural background levels for the State. Measurements within two homes showed up to ten times background. This is equivalent to having a diagnostic chest x-ray every week or two.

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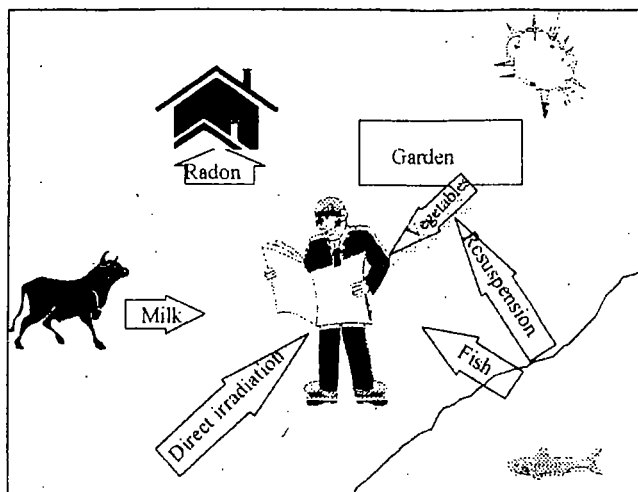
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**Figure 1. Radiation pathways to a resident living on "reclaimed" land. Direct radiation from the ground, ingestion of food and soil, and inhalation of radon and resuspended particulates are the major pathways.**

A trip into the hot zone, where phosphate is king  
By MARY JO MELONE  
©St. Petersburg Times, published October 14, 1997

Scientists at Cape Canaveral were trying to shoot radioactive plutonium up over our heads Monday morning, in the name of exploring Saturn.

This had many people distressed, and while I sympathize with their fears of an accident, it's hard not to wonder about their priorities. Why worry about radiation falling out of the sky when you can worry about the radiation next door?

Some hours after the Cassini spacecraft was grounded due to weather, I was riding in a Chevy Suburban across the roads of Polk County and listening to something called a micro Roentgen meter, which measures radiation, clicking and crackling and driving a pointer back and forth.

Watching this was like being a bit player in some old movie about the earth's last survivors crawling out of the bomb shelters after the Russians dropped the big one. Only the bad guys, if that's what they are, are the phosphate companies. They weren't doing anything terrible -- just making fertilizer and money.

I was riding with Andrew Gross, the head of a company called Radiation Protective Services, and his technician, Wade Smith. The first place we stopped was Mulberry's Phosphate Museum. The fact that tiny Mulberry, 30 miles east of Tampa, has a museum dedicated to phosphate will give you a clue how important the stuff is people in this town.

A bed of phosphate, scattered as if in a large sandbox, is next to the museum. Toys are there for kids who want to dig. Gross moved the meter across the phosphate lot. At one point, the arrow struck 200, which means the lot was emitting nearly 70 times normal background radiation.

"It's like something out of The Simpsons," he wisecracked.

Then we drove down to the site of a new library in the county seat, Bartow, under construction in a public park donated by a phosphate company, and next to a lake created by a mine that was reclaimed and filled with water.

Near the water's edge, the meter read 130. A short distance away, where two women were doing their best to help the environment by dumping cans and papers into recycling bins, the meter read 70. You don't have to be Madame Curie to think this might signal a magilla of a health threat. According to state officials, the radiation readings inside a house should be no higher than 20. It doesn't stand to reason the rules for outdoors would be much different.

What has happened in some parts of Polk is much like what has happened near the Anclote River on the border between Pasco and Pinellas, near the closed Stauffer Chemical Plant -- where the radioactive byproduct of phosphate manufacture was sold as road bed material and now some streets near Tarpon Springs are radioactive. But the problem in Polk may be bigger. Much bigger. The radioactive wastes were plowed back into the land around the mines to landscape them, so housing developments with the promise of waterfront living could be built around the lakes created, Gross said.

Scores of mostly Northern retirees looking for their place in paradise may have ended up buying and living for years in homes built on toxic waste.

This is the kind of situation that lawyers love, of course, and

Gross works for one, Richard McKinley of Bartow. He said he has 100 homeowners -- even some in Hillsborough and Pasco -- preparing to sue the phosphate companies. So if you don't like lawyers, don't believe Andrew Gross. Florida's Institute of Phosphate Research, which is run by the state but financed by taxes the industry pays, doesn't. Officials there said his radiation-detecting equipment must not be working right. You can understand why they might say that. The phosphate industry is a heavy hitter in Florida, not just in Polk, and the apparently radioactive byproducts were sold who knows where. We could be talking some serious money to repair a bunch of real estate, maybe make some lives whole again. Mostly, we could be talking one hell of a fight.

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(b) (6)

10/21/97 - Contacted the law firm of Richard McKinley with regard to getting in touch with Andrew Gross (Radiation Protection Services).

I was informed that he was not where he could be reached by phone, but he would be contacted and asked to call me.

10/23/97 - Melissa - stated she cannot get in touch with him but has left a message. She also stated that they have no address for him - he does contact them every 2 weeks or so. She suggested sending something to him via their office.

October 28, 1997

Andrew Gross  
Radiation Protection Services  
c/o Richard A. McKinley, Attorney  
PO Box 2228  
Bartow, FL 33831-2228

Dear Mr. Gross:

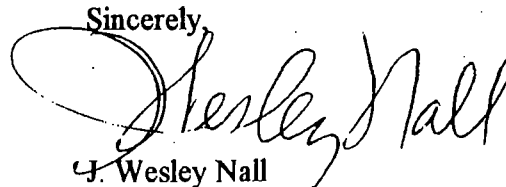
We are concerned about the radiation measurements which you performed recently in Polk County which were reported in an article in the St. Petersburg Times on Oct. 14, 1997. In particular the reported measurement of 200 uR/hr on the small phosphate rock pile at the Mulberry Phosphate Museum is much higher than measurements which we made at this location in June, 1997. The maximum measurement noted at that time was 65 uR/hr. This was made using a pressurized ion chamber.

Attached is a copy of the announcement of a gamma survey instrument/pressurized ion chamber intercomparison which I recently received. These are held regularly by the State of Florida Department of Health, Bureau of Radiation Control because of the variation in survey instrument response to the naturally occurring radioactive material associated with the phosphate deposits in central Florida.

These intercomparisons are open to all interested persons. There is no fee. We advise all persons performing radiation exposure measurements in the environment or for scrap metal processors or phosphate chemical plants in this area to participate regularly in this intercomparison to assure an accurate assessment of radiation levels.

Please feel free to contact me at 941-291-5204 if you have any questions.

Sincerely,

  
J. Wesley Nall  
Health Physicist

cc: Richard A. McKinley, Attorney

---

**POLK COUNTY HEALTH DEPARTMENT**

Daniel O. Haight, MD  
Director

RADIOLOGICAL HEALTH SECTION / WATER TESTING LABORATORY  
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Lynne M. Sweeney, MD, MPH  
Assistant Director



**Radiation Protection Services  
Louisiana Business and Technology Center  
Louisiana State University  
South Stadium Drive  
Baton Rouge, Louisiana 70803-6100  
ph. 504.388.4244 fax 504.388.3975**

October 29, 1997

Wesley Nall, Health Physicist  
Polk County Health Department  
Radiological Health Section  
225 Avenue D, NW  
Winter Haven FL 33881

Via Facsimile

Dear Wesley:

Thank you for your letter of October 28 and for your invitation to participate in your intercomparison study of hand held gamma survey instruments and PICs. While we will likely send a representative to observe, we will not have technicians in the area on November 5<sup>th</sup>.

Although not specifically discussing the issue, your letter implies the greater "dose" accuracy of a properly calibrated PIC. While we are aware of the value of PIC measurements for assessing external gamma dose, most of the states which have adopted the suggested state regulations for the control of technologically enhanced naturally occurring radioactive material are in fact using NaI scintillation systems to assess compliance, usually with a Cs-137 calibration. In addition to these instruments, we are also using Bicron plastic scintillators. Presently, our chief concern is in determining exposures in the area relative to regulated states and other sites around the country we have assisted in cleaning up. Frankly, millions of dollars have been spent by other industry to remediate areas with significantly lower contamination and external gamma levels.

In assessing dose, we are exploring all pathways. The external gamma pathway is being determined largely by the use of long-term tissue equivalent dosimetry studies. The Radon pathway, which your department has studied extensively, will also be explored. The inhalation and ingestion pathways, which we believe to be likely the largest dose contributors, will be studied extensively over the next several months. I have not been able to find any significant studies to date on these pathways other than vegetation uptake studies. Any assistance you can provide would be greatly appreciated.

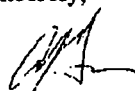
Regarding the Mulberry museum, you can appreciate my surprise in finding elevated levels in an area designed for digging by children. Our experts, including two Health Physicists, were equally surprised by the situation. Our readings on this pile was determined using a NaI Scintillator in contact with the surface. I would expect PIC measurements to be lower, however, even the measurements your office found, considering the use of the area, are alarming. We have videotaped families with small children digging through this material. The digging activity resulted in clouds of radioactive material swirling about the area and several of the children were observed to egress the area with the material sticking to their skin and clothing.

Wesley Nall  
October 29, 1997  
page two

My firm has been contracted by a number of law firms to provide an assessment of the contamination of the community as a result of the phosphate industry. While I would enjoy the opportunity to further discuss and review our findings, I need to receive prior clearance from the attorneys involved.

Again, I appreciate your concern. Hopefully we can get together the next time I am in the Polk County area.

Sincerely,



Andrew J. Gross  
Prsident  
Private line: 504-791-9766  
e-mail: ajgross@earthlink.net

cc: file, dist.

## Questions for Lawyers at Homeowners Meeting on October 6

Q-1 According to the U.S. government the average American receives 360 mrem of radiation per year. Nuclear plant workers receive an additional 300 mrem per year above the average (or a nuclear plant worker receives a total of 660 mrem per year.) By living in Lake Pointe Village what additional radiation do we receive over the average of 360 mrem?

Q-2 Radon is the biggest component of the total radiation exposure which we receive every year. Have you measured radon levels in our homes? If you have measured radon in our homes, what is the level? The EPA has a limit of 4 picoCuries per liter

Q-3 Are these lawyers looking for someone to take the lead in a "potential class action?" Has the court certified a class in this case? Who are they going to sue?

Q-4 If this is in fact a real problem, why hasn't the EPA approved "Super Fund" money for the clean-up?

Q-5 If payment is made in services, will we owe the law firm 40% of the value of such services?

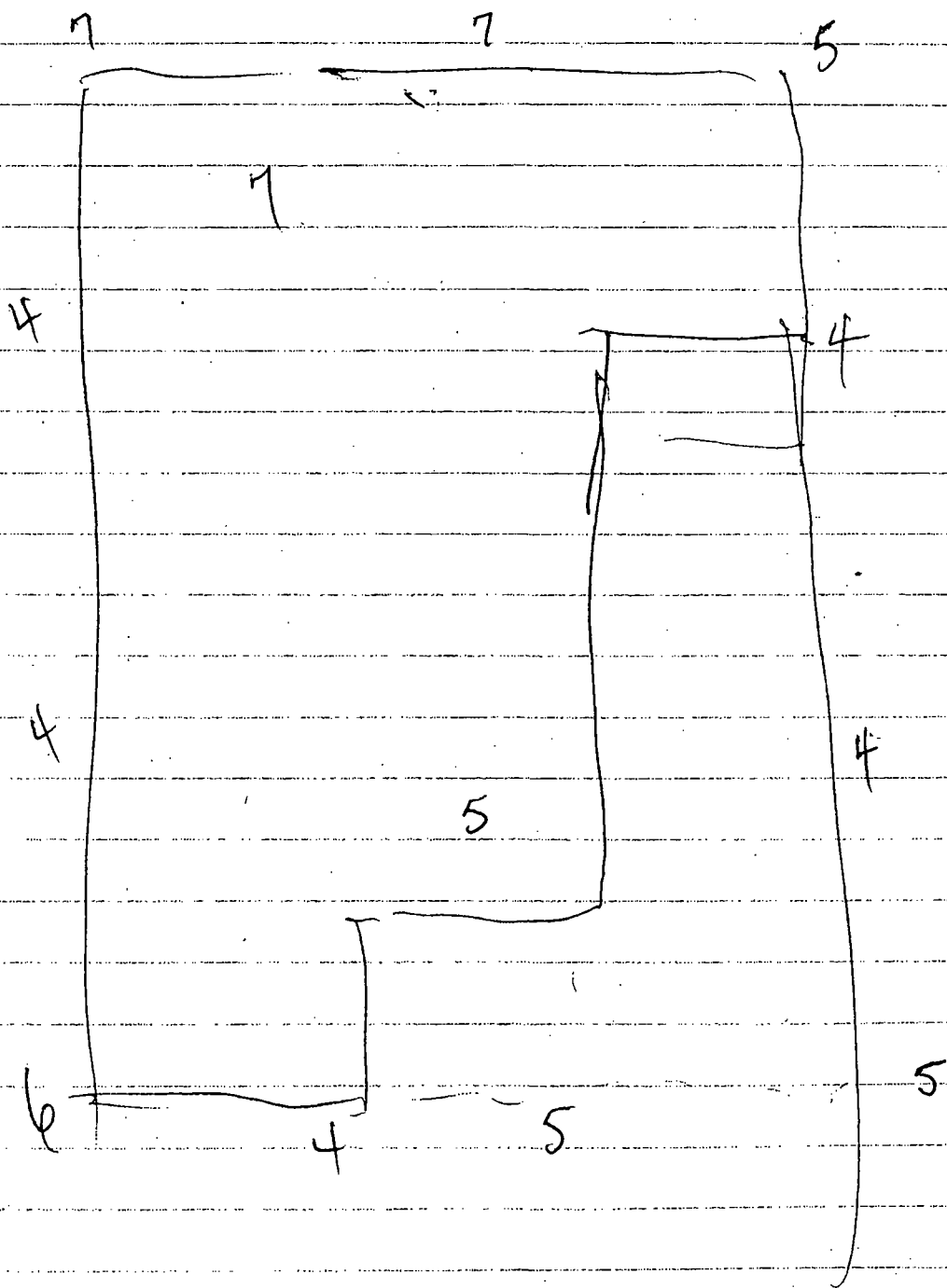
Q-6 When will we receive a copy of the contract signed by you?

Q-7 How extensive is the area being covered? Lake Pointe Village? Mulberry? Polk County?

Q-8 What effect will our signing of the Radon Gas Notification Form, as required by 404.056(x) F.S. at the time of our closing, have on this case?

LAKE      POINTE      VILLAGE  
MON. OCT. 6, 1997 7pm  
→ Mon Nov 3, 1997 7pm  
ALVIN J. MCNEILL  
PRESIDENT - 425-0769

Nelson Deming (b) (6)  
(b) (6)



wesley 11:40  
9-23

Andrea Smentek  
Fed. of MH Owners of FL  
(b) (6)

An Attorney has contacted a  
home owner about Radiation  
on reclaimed land &  
the owner contacted the  
Federation. she would like  
to know if this is for  
real or ISH pulling  
LJ V

**NORM Contamination Litigation:  
Moving From Oil & Gas to Phosphate**

**Walter Cofer**

**URP 5427**

**December 3, 1998**

## **Introduction**

NORM is an acronym for naturally occurring radioactive material. While generally defined as any material that is radioactive in its natural state, it also has a distinct regulatory meaning. In the realm of radiation control agencies, NORM refers to natural radionuclides that inadvertently accumulate as a result of human actions. The more accurate term is TENORM – technologically enhanced NORM, but each is used to describe concentrations of radiation above natural levels.

Over the past twenty years, NORM has emerged as a new and exceedingly difficult problem in the environmental regulatory arena. At both the state and national level, government agencies have grappled with the development of appropriate regulatory approaches to the problem. Litigation has been a driving force, and continues to influence regulatory actions. Almost from the beginning, Florida has been at the forefront of the battleground, due to the presence of major mining industries that generate NORM as a byproduct. Until recently, the state's industries have managed to avoid significant legal actions. However, there are now multiple NORM-related lawsuits currently before the courts that may significantly alter the state's legal landscape. A discussion of the nature of NORM, the scientific controversy that is integral to the NORM issue, and the basis for the current lawsuits is therefore warranted in order to understand the difficulties inherent in addressing the legal and regulatory issues associated with NORM.

## **Background**

To the layman, radiation is associated with predominantly negative connotations. Atomic bombs, fallout, the China Syndrome, Three Mile Island, Chernobyl, nuclear waste, and mutant monsters are some of the images invoked by the term. There should be little wonder then, that when informed of the presence of radioactive contamination on one's property, the first reaction might be fear, or at least the very least heightened health concerns. Unfortunately, most people are not well informed about radiation

and the ubiquitous nature of radioactivity. The Health Physics Society (HPS), a professional society of radiation safety specialists, provides an illuminating description of natural radioactivity.

“Radiation is a natural part of the earth’s environment. It comes from the sky above us, the earth beneath us and even from our own bodies. The air we breathe and the food we eat contain some naturally occurring radioactive materials. In fact, the average person in the United States receives a radiation dose of about 300 millirem\* per year from natural sources compared to a dose of about 50 millirem per year from “artificially produced” sources including medical x-rays. The average dose from natural background radiation varies across the country from 300 millirem per year on the coasts to 500 – 600 millirem on the Rocky Mountain West. Natural radioactive material in rocks and soil account for about 28 millirem of the radiation dose the average person receives in a year. The earth’s crust contains small amounts of uranium, thorium, and radium as well as radioactive isotopes of several elements including potassium. The radiation dose comes from the gamma rays which are emitted from the rocks, soil and some building materials (such as bricks and concrete). Small amounts of radon, a radioactive gas which comes from the radioactive decay of uranium, seep into the atmosphere from the soil. On average, inhalation of the radon in homes and other buildings accounts for 200 millirem per year. About 11% (40 millirem) of our radiation dose comes from naturally occurring radioactive materials in the body. Radioactive potassium-40, as well as other radioactive materials (such as carbon-14) which occur naturally in air, water, and soil are incorporated into the food we eat and then into our body tissues. Cosmic radiation comes from outer space. The radiation dose from cosmic radiation increases with altitude, roughly doubling every 6,000 feet. Therefore, a resident of Florida (at sea level) on average receives about 26 millirem. A passenger in a jetliner traveling at 37,000 feet would receive about 60 times as much dose from cosmic radiation as would a person standing at sea level for the same length of time.”<sup>1</sup>

Natural radionuclides can be concentrated by both natural and human actions. Heavy minerals in sand can be segregated by wave action into distinct ore bodies with economic value. Such ores may include thorium-bearing minerals such as monazite, creating elevated radiation levels. Other mineral deposits also concentrate uranium, thorium and their decay products, including coal, phosphate, tin, and bauxite. Industries that extract the minerals inadvertently concentrate the radionuclides as deposits on process equipment and in waste streams during mining and beneficiation processes. Industries that utilize large quantities of process water (e.g., petroleum production, pulp & paper, and water treatment facilities) must also deal with NORM. Radium, due to its chemical structure, substitutes for calcium, barium, and strontium in carbonate and sulfate deposits, producing radioactive scale deposits on process and filtration equipment. Cleaning operations expose workers to radiation emitted by gases, scales, sludge, and other waste streams.<sup>2</sup>

\* The millirem is the term used to describe the amount of radiation absorbed in the body, adjusting for radiation type.



NORM wastes are divided into two categories: highly concentrated discrete materials such as the aforementioned scales, and diffuse, generally less radioactive wastes. The latter category is more common; the U.S. Environmental Protection Agency (EPA) has estimated that billions of tons of such waste are produced each year in the United States from more than 50 specific waste processes. Determining how such materials should be handled and disposed presents an enormous challenge for generators and regulators.<sup>3</sup>

### **NORM Laws and Regulations**

NORM represents a gap in the regulatory framework of radiation control. It was specifically excluded from the scope of the Atomic Energy Act of 1954, because the Act's focus was on materials and processes associated with the nuclear fuel cycle. Thus, the principal federal regulatory authority for radiation, the Nuclear Regulatory Commission (NRC), has no jurisdiction over NORM. The EPA has established limits for indoor radon and radioactive material concentrations in water, and its Office of Indoor Air and radiation has spent years researching the subject. Subtitle C of the Resource Conservation and Recovery Act of 1976 has been interpreted as excluding NORM wastes. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) includes radium-226 as a listed hazardous substance, which may incur response costs, so the EPA oversees the cleanup of Superfund sites contaminated with NORM. However, lacking a clear congressional mandate and limited resources, the agency has been reluctant to expand its jurisdiction to comprehensively regulate NORM at the national level. Thus, primary responsibility for NORM has been left to the states, which have taken widely varied regulatory approaches.<sup>4</sup>

States hosting major oil & gas industries were the first to promulgate NORM rules in response to oilfield contamination problems. The oil industry actively sought regulation in an effort to stem the tide

\*The Florida Bureau of Radiation Control currently licenses one service company in Eaton Park for its equipment cleaning operations, and is in the process of licensing a second service company located in Mulberry.

of NORM-related lawsuits. Louisiana, Texas and Mississippi each took similar approaches to regulate the storage, use, transfer and disposal of NORM, including the licensing of waste generators and companies providing remediation and disposal services. Differences in exemption levels and radiation dose standards led the Conference of Radiation Control Program Directors, Inc. (CRCPD), an organization of state radiation control agencies, to draft proposed NORM regulations for member states to adopt. Due to a lack of consensus on numerous issues, the suggested state rules went through multiple revisions over the past decade. In the interim, several states adopted the draft version or rules similar to those in place in Texas and Louisiana. Most states have tried to apply their existing rules to any problems that arise, either because they do not believe that their NORM issues warrant specific regulations or because of bureaucratic inertia and/or opposition from potentially regulated industries. The CRCPD's model rule was not finalized until October of this year, and has still not been formally released.

Florida has yet to adopt formal NORM rules, despite having identified three major industries with NORM contamination problems (phosphate, heavy mineral sands, and oil & gas), along with multiple other industries with potential problems. Its Bureau of Radiation Control has been actively studying the NORM issue for the past two years in an effort to determine an appropriate regulatory solution. NORM licenses have been issued to all of the phosphate companies in central Florida, as well as to one of the two heavy mineral sands mining companies located in the northeast. Surveys of the phosphate industry in north Florida, oil & gas operations in the southwest and Panhandle, and the other heavy mineral mining facility in the northeast have not identified serious problems warranting licensure. However, research into the state's NORM issues is ongoing and additional regulatory action, including some form of rulemaking, is likely to occur in the future.

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## NORM Litigation

NORM litigation arose from the oil & gas industry with the discovery of NORM contamination in the Raleigh, Mississippi oil field in 1986, which resulted in the *Street v. Chevron USA, Inc.* case. Street, Inc. was a machine shop and pipe cleaning company located in Laurel, Miss. that cleaned oilfield piping supplied by Chevron and other oil companies. When Chevron workers discovered elevated radiation levels in production pipes at a nearby oilfield, the company informed the state's Division of Radiological Health. Follow-up surveys found contamination present at the Street site and at other former pipe-cleaning facilities and wellheads. Alleging negligent failure to inspect and warn, Street sued Chevron (in *Street, Inc. v. Chevron*) for loss of business, loss of goodwill, loss of corporate clientele and credit, loss of use of property, loss of income, and loss of the value of personal and real property. Street's owner and employees sued (in *Street et al. v. Chevron*) for compensatory and punitive damages, alleging disruption of bodily tissues and cells, chronic nasal and sinus inflammation, bone pain, osteonecrosis (bone death), psychological stress, increased risk and/or fear of cancer, loss of wages and/or wage earning capacity, past and future mental pain and suffering, past and future physical pain and suffering, past and future medical expenses and/or monitoring costs, past and future costs of psychological evaluation and treatment, and past and future loss of enjoyment of life. The two suits were tried together in United States District Court for the Southern Region of Mississippi as *Street v. Chevron USA, Inc.*<sup>5</sup>

Two issues were central to the plaintiffs' case: (1) industry knowledge and (2) injury and causation. For the first issue, the plaintiffs successfully demonstrated at the trial that the oil companies had prior knowledge of the potential for accumulation of radioactive scale in oil well piping, so Chevron was negligent because (a) they had reason to suspect the presence of contamination and failed to conduct an inspection of the Street facility; and (b) they had knowledge of the dangers associated with the piping and failed to warn the plaintiffs of the danger. As for injury and causation, the plaintiffs were less

<sup>5</sup>The Florida Bureau of Radiation Control currently licenses one service company in Eaton Park for its equipment cleaning operations, and is in the process of licensing a second service company located in Mulberry.

successful. The primary injuries alleged were bone pain, bone death and emotional trauma. Despite allegations of inhalation and ingestion of large quantities of radium, the plaintiffs lacked any apparent injuries to support their case. Reliable measurements of their whole body radium content found that the levels present in the plaintiffs' bodies were below measurable levels, forcing their own experts to concede that the results were inconsistent with allegations of large radium intakes that could cause bone injuries. The plaintiffs' psychology expert testified her belief that they suffered from stress based on their belief about their exposure, rather than any actual exposure to radiation. The stress argument was weakened by flaws in the experts test methodology.<sup>5</sup>

The Chevron trial began in 1992 and ended with an out-of-court settlement six months later. In addition to settlement costs, the company spent approximately \$10 million to remediate the Street site. The *Street v. Chevron* case was only the beginning of such lawsuits, however. Oil & gas NORM litigation has become somewhat of a cottage industry for lawyers in the region as more and more contaminated sites have been identified. Landowners have sued Chevron repeatedly, and many other oil companies have also suffered similar fates. Mississippi's Division of Radiological Health has also been sued repeatedly, facing allegations of failure to adequately enforce its radiation control regulations. The program's director eventually resigned due at least in part from his frustration at spending all of his time tied up in courtrooms responding to litigation either against his agency or against oil companies operating within the state. Around forty NORM lawsuits are currently being processed in Mississippi, which has led other states to the conclusion that that passage of NORM-specific regulations does not resolve the legal issues at stake. To date, no other cases have made it to trial; the industry consistently has elected to settle such cases out of court.<sup>6</sup> NORM lawsuits are also being handled by courts in Alabama, Louisiana, Arkansas and Texas.<sup>7</sup>

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The typical claims made in landowner cases have been comprehensive, as described below.

- *Strict liability* (high degree of risk of harm to plaintiffs; risk not controlled by reasonable care)
- *Punitive damages* (failure to inspect and warn shows utter disregard for plaintiffs' rights)
- *Property damages* (cost of site investigation, monitoring; cleanup and/or remediation; loss of property values; stigmatic losses)
- *Bodily tissue and cell damage* (NORM has caused injury to plaintiffs)
- *Declaratory relief* (company is liable for all costs of site investigation and cleanup)
- *Injunctive relief* (require company to perform site investigation and cleanup)
- *Negligence claims* (failing to inspect; failing to warn plaintiffs; failing to warn of dangerous properties of NORM)
- *Nuisance claims: public, private or nuisance per se* (company made unreasonable, unwarrantable, or unlawful use of surface; company's use caused annoyance, inconvenience, discomfort to hurt to either plaintiffs or the public)
- *Assault* (company intentionally exposed people to harmful radiation; exposures caused plaintiffs imminent apprehension)
- *Battery* (harmful contact actually occurred)
- *Trespass to land* (company stored, released, disposed of NORM without plaintiffs' consent)
- *Breach of contract* (nonperformance to contract terms and damages).
- *Waste* (company destroyed and devalued plaintiffs' real property)<sup>8</sup>

### **NORM Litigation in Florida**

While NORM litigation originated in the oil & gas states and continues there unabated, the phosphate industry in Florida has recently become the target of similar lawsuits. The circumstances in the Sunshine State have some distinct differences from those in the petroleum industry, however. A large number of support industries scattered throughout the oil & gas states provide equipment maintenance and repair services to oil companies, leading to numerous instances of NORM contamination requiring remediation. In Florida, the phosphate industry is concentrated in two regions: the Bone Valley region in Polk and surrounding counties, and the smaller Hawthorne Formation region located near White Springs and Lake City. The northern phosphate region has only one company in operation, and there are no service companies in the area. In the Bone Valley, a dozen or so service

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companies exist, but site surveys by the state's Bureau of Radiation Control have identified only minor contamination present at the facilities.\* Subsequently, there have been no attempts by the service companies to pursue property damage or other claims against the neighboring phosphate companies.

Consolidation in recent years has decreased the number of phosphate companies from more than a dozen to the current eight, but some companies operate multiple wet phosphoric acid plants that employ chemical processes to convert phosphate ore into fertilizer (14 plants total). The plants generate huge quantities of phosphogypsum as a byproduct of their operations. Due to the presence of low concentrations of radium, metals and other hazardous substances in phosphogypsum, the EPA has restricted commercial use of the material, resulting in the creation of massive "gyp stacks," manmade mountains of waste towering over the landscape. The stacks are regulated by the EPA and the state's Department of Environmental Protection (DEP). Earthen caps are required to limit airborne releases of radon gas emanating from decaying radium, and newer stacks are required to have geomembrane liners to limit migration of contaminants into the Floridan aquifer. While the industry has experienced numerous problems related to their gyp stacks (massive fish kills in nearby rivers have resulted from breaches in holding ponds located atop the stacks), NORM has not been the basis for any gyp stack-related lawsuits.

Property contamination in the petroleum industry results from scale, sludge and other residues from briny production water pumped from wellheads along with the oil and natural gas.. Phosphate mining requires removal of overburden to reach the ore, which may be just below the surface or 30 feet down. The result is a "moonscape" effect on the mined property that requires major reclamation work to level the land. Reclamation rules were not imposed by the DEP until 1975, so land that predates the reclamation rule can exhibit elevated radiation levels. When such land is developed, residential property owners may have to contend with ambient radiation levels that exceed background levels, and buildup of radon gas within their homes. The issue of homes built on mined land is the basis for

Recent NORM litigation in Florida. In July, three claims were filed in Polk County Circuit Court:

(1) *Janie L. Morgan v. W. R. Grace & Company – Conn. and Florida Phosphate Council, Inc.*, (2) *William R. Aumann and Cecelia G. Aumann v. W. R. Grace & Company – Conn. and Florida Phosphate Council, Inc.*, and (3) *Joseph W. Polakiewicz and Helga Polakiewicz v. United States steel Corporation, International Mining and Minerals Corporation and Imcerga Group, Inc., Mallinckrodt Group, Inc. and Mallinckrodt, Inc., and Florida Phosphate Council*. The plaintiffs are Polk County property owners with homes built on reclaimed land that predated the 1975 reclamation rule. The Florida Phosphate Council (FPC) is a non-profit Florida corporation representing the interests of state phosphate companies. The other defendants are Polk County phosphate companies or their legal successors.<sup>9</sup>

Each of the plaintiffs seeks damages in excess of \$75,000 alleging that the companies brought radioactive materials to the surface during mining and failed to return the land to a condition where radiation was at background levels, with knowledge that the land would be sold to third parties for residential development. The plaintiffs further allege that they purchased their land without knowledge of the excess radiation levels, and that long term exposure to the radiation creates a health risk making the homes not safely habitable and/or in violation of various statutes and guidelines. As the industry trade association, FPC was charged with dissemination of misleading and false information regarding the safety of the reclaimed land. FPC has since been dropped from the suits (FPC had no direct connection to the properties in question). The plaintiffs' claims against the phosphate companies are listed below.<sup>9</sup>

- *Negligence and failure to warn* (companies failed to exercise reasonable and ordinary care by their improper reclamation efforts to ensure that radiation levels were safe and by their failure to warn the plaintiffs of the danger)
- *Ultrahazardous activity* (companies are strictly liable for damages caused by ultra-hazardous activities, including but not limited to cost of cleaning up land, reduced property values, and damages from impact of public fear of radiation contamination)

<sup>9</sup>Subsection 64E-5.1001(2), Fla. Admin. Code: "The mean gamma rate in a building shall not exceed 20 microR/hr, including background, and the annual average radon decay product concentration shall not exceed 0.02 Working Level, including background."

- *Nuisance* (plaintiffs exposed to excessive radiation on the property and on adjoining properties as a result of companies mining and reclamation activities)
- *Violation of Statutes* (companies discharged radioactive waste products, requiring judgment for damages, together with interest and costs)
- *Fraud* (companies had knowledge of the contamination and hazard but failed to disclose knowledge of, and concealed existence of the hazard)
- *Negligent representation* (companies had knowledge of the contamination and hazard but represented the land as safe; plaintiffs relied on misrepresentations when they purchased their land)<sup>9</sup>

The Polk County suits appear to be the result of solicitation efforts by the New Orleans law firm that handled the *Street* and other petroleum NORM-related legal actions. The firm mailed a questionnaire to its Florida clients prior to the suits being filed, and had previously hired health physics consultants to investigate radiation levels in the Bone Valley region, concentrating on high end residential developments. The cases are being handled jointly by firms from New Orleans, Philadelphia and Fort Lauderdale. An attorney with one of the firms has stated that their hope is that the suits will evolve into a mass action, which allows groups of related cases against the same defendants.<sup>7</sup>

### Conclusion

The implications for the outcome of the above actions may be far reaching. Mined lands constitute thousands of acres in Polk and surrounding counties. Much of the land was mined by companies no longer in existence, so the question of liability may become an issue. The state's environmental radiation standards have no inspection or enforcement provisions, and the lack of specific NORM rules further complicates regulatory compliance. The fact that mining of the land in question predates the 1975 reclamation rule also clouds the legal issues at stake. Because the claims are purely tied to property damage, the issue of injury from radiation levels that fall close to background levels is avoided. However, the claims of diminished property values are tied to concerns about the contamination present, so the theoretical basis for radiation standards, which are the subject of a fierce on-going debate, will likely come into play. The cases will be interesting to follow.



## Bibliography

1. Health Physics Society (1998), "Natural Radioactivity," <http://www.hps.org/natural.html>.
2. Gesell, T. F., and H. M. Prichard (1975), "The Technologically Enhanced Natural Radiation Environment," *Health Physics*, 28, pp. 361 – 362.
3. Health Physics Society (1998), "Naturally Occurring Radioactive Materials," <http://www.hps.org/norm.html>.
4. Cox, J. R. (1993), "Naturally Occurring Radioactive Materials in the Oilfield: Changing the Norm," *Tulane Law Review*, 67, pp. 1209 – 1211.
5. Martindale, D. L. (1995), "NORM – Science, Regulations and Litigation," *Proceedings of the American Petroleum Institute NORM Conference*, October 1995, pp. D.L.M.17 – D.L.M.25.
6. Smith, B. (1998), Mississippi Department of Health, Division of Radiological Health, telephone interview, November 10.
7. Rousos, R. (1998), "Suits Claim Land Risks," *The Ledger*, Lakeland, Florida, July 26, 1998, p. 1A. (on 1B?)
8. Johnson, R. H. (1995), "NORM Litigation: Typical Claims in Landowner Cases," *Proceedings of the American Petroleum Institute NORM Conference*, October 1995, pp. R.H.J.1 – R.H.J.7.
9. Case No. G98-2034, *Janie L. Morgan, Plaintiff, v. W. R. Grace & Company – Conn. and Florida Phosphate Council, Inc., Defendant*, Case No. G98-2035, *William R. Aumann and Cecelia G. Aumann, Plaintiff, v. W. R. Grace & Company – Conn. and Florida Phosphate Council, Inc., Defendant*, and Case No. G98-2039, *Joseph W. Polakiewicz and Helga Polakiewicz Plaintiff, v. United States steel Corporation, International Mining and Minerals Corporation and Imcerga Group, Inc., Mallinckrodt Group, Inc. and Mallinckrodt, Inc., and Florida Phosphate Council, Defendant*, Polk County Circuit Court, Polk County, Florida, 1998.

**Brian Birky, Ph.D.**

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Gainesville, FL 32607  
(352) 377-3416

November 2, 1998

To: Elissa Preheim  
c/o Arnold and Porter  
555 12<sup>th</sup> St. N.W.  
Washington, D.C. 20004

From: Brian Birky, Ph.D.

Dear Elissssssssssssssssssssssa:

Oops, is there one 's' too many in there? On to more serious matters, you will find the following items enclosed.

1. Information about radionuclide concentrations in soils: background levels across the U.S. for comparison, and in central Florida soils altered by phosphate mining.
  - a. "Determination of concentrations of selected radionuclides in surface soil in the U.S." by Myrick, et al. (No electronic file) Full text.
  - b. "Radioactivity in food grown on mined phosphate lands" by Guidry, et al. (No electronic file) Cover page only. You can get a copy from the Florida Institute of Phosphate Research (FIPR) in Bartow. It may be worth a trip to their library for related information.
2. Radon information from B. Cohen. Dr. Cohen is well respected, but controversial, i.e., his publications have generated many response letters in the Health Physics journal in recent years. He tends to be anti linear non-threshold theory, and pro hormesis.
  - a. Literature search of Bernie Cohen's publications through 1995 (I found more in the HP Journal since that time - listed only).
    - i. Literature search (file = Bernie Cohen's publications culled.wpd)
    - ii. Health Physics Journal publications since 1995: 70(5):695; 72(1):114; 72(3):489; 72(4):615; 72(4):623; 73(3):531; 74(6):S51; 75(1):4 by Lubin; 75(1):11 same subject; 75(1):18; 75(1):23; 75(1):29; 75(1):31; 75(3):324. Listed only.
3. Radiation risk
  - a. "Radiation Risk in Perspective" is the HPS Position Statement adopted January 1996. Full text. File = HPS PS on risk in perspective.wpd
  - b. "BEIR V and its implications" from Nuclear News (August 1990). Full text. File = BEIRV.wpd
4. Legal publications. Donald Jose appears to be the expert in this field. He is an affiliate member of the HPS and a lawyer practicing in Pennsylvania who formerly worked for the Dept. of Justice in D.C. His current phone number at work is (610) 436-1888.
  - a. "ALARA: Two court decisions with dramatically different implications" from Nuclear News (June 1996). Full text. File = WIEDIS.wpd
  - b. "Are NRC permissible dose limits really permissible?" from Nuclear News (March 1991). Full text. File = JOSE1.wpd
  - c. "Radiation Litigation: Present and Future" is an older lecture by Jose and the scribbled notes may be his own. Full text. File = JOSE3A.wpd

- d. "Resolution of Radiation Litigation" is another old Jose lecture. Full text. File = JOSE2c.wpd
- e. Comment and response by Jose in HPS Journal 74(6):722. Not included.
- f. "Naturally Occurring Radioactive Materials in the Oilfield: Changing the NORM" by James R. Cox in the Tulane Law Review 67(4):1197-1230. Cover only.
- g. Literature search of "litigation or tort" in HP related journals to 1996. See printout. Full text. File = tort and litigation culled.wpd

I have highlighted items or sections of particular interest in each of the enclosures. We also spoke of a low dose exposure to radiation from a Cs-137 density gauge in a phosphate chemical plant that I conducted a dose reconstruction for in late 1991 and early 1992. The lawyer representing the phosphate company (Cargill) was Donald S. Bennett of:

Fowler, White, Gillen, Boggs, Villareal & Banker, P.A.  
501 East Kennedy Blvd.  
Tampa, FL 33602  
(813) 228-7411

They also have an office in D.C.

Sincerely,

Brian Kent Birky  
Senior Health Physicist  
Applied Environmental Consulting, Inc.

ELISSA J. PREHEIM

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